

FRESHWATER ALGAE FROM INDIA

**BY
NELLIE CARTER, D. Sc.**



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FRESHWATER ALGAE FROM INDIA

BY

NELLIE CARTER, D.Sc.

The Algae recorded in this paper were collected by Mr. I. H. Burkill at various times between 1906 and 1912 in India. A considerable amount of work has already been done on the algal flora of the Indian region, and a complete list of the literature relating to it will be found in W. & G. S. West, *Freshwater Algae from Burma, etc.*, 1907, so that it is unnecessary to refer to these papers here.

The majority of the collections were made near the North-Eastern frontier, in North Cachar, the Assam plains, and in the Sikkim and Abor Himalayas. A number also came from the North-West Himalayas near Simla, or from Nepal. The remaining samples were collected in the Plain of the Ganges, on the Satpura Hills in the Central Provinces, from Akyab, or in the Dawna Hills.

Most of the samples were taken at fairly high altitudes, varying from 2,000 ft.—10,000 ft., whilst a few of the collections were made at about 400 ft.—700 ft. The latter, as would be expected proved to be much richer than the former; in fact nearly half the species recorded here occurred in a single sample taken from a ditch in a rice field near Sadiya at 400 ft. in which over 90 species were recognised. These included many of the beautiful and striking Desmids of the Indo-Malayan type (see W. & G. S. West. *Alg. Burma* 1907).

An extremely interesting find amongst the comparatively lowland collections was a small form of *Oocardium stratum* Næg. freely conjugating. This extraordinary Desmid has only previously been recorded from Great Britain, France and Germany, and is regarded as very rare, and the zygospores have not previously been seen. Its discovery amongst the Indian Algae is therefore of extreme interest, and it is possible that the Alga is quite generally distributed in limestone localities.

The collections from higher altitudes were very different in character, and much poorer as regards number of species. There was a complete absence amongst the Desmids of those Indo-Malayan types so striking in the localities

of lesser altitude, their place being taken by Desmids of a more ubiquitous or even alpine character.

Certain interesting records are made for species only hitherto known from Europe. For example, *Cosmarium Garrolense*, described by Roy and Bissett from Scotland, occurred in a collection taken from Mount Tonglu at 10,000 ft. in the Sikkim Himalayas, in company with *C. quadratum* f. *Willei*, only previously known from Northern Europe and Siberia.

The occurrence in the North-Western Himalayas at 8,500 ft. of a form of *Debarya* very near to *D. desmidioides* described by W. & G. S. West from Cornwall is of further interest. It is peculiar also that *Fragillaria Ungerianum*, the Diatom whose long ribbon-like colonies are so common in the North-West Himalayas and also in the Central Provinces, was not observed at all in the collections from the North-Western Himalayas.

Although the collections were perhaps not sufficiently numerous to make very definite statements possible, the investigation has proved interesting in indicating that the Indo-Malayan type of Desmid is confined to the comparatively low-lying districts of the area, and that altitude is a factor which plays a part in the distribution of Desmids, just as in the higher plants.

This investigation was carried out at the University of Birmingham during the period 1919-1921 with the aid of a grant from the Department of Scientific and Industrial Research. The author wishes to acknowledge the kindness of Professor R. H. Yapp for allowing her the facilities of the Botanical Department and also to express her gratitude to Dr. J. S. Bayless-Elliot for constant encouragement.

A list of the collections is given below :—

25390.

26847. Near Erki on the west of Simla, a dry region of gravels near the edge of the hills; about 3,000 ft. May 9, 1906.

26880. Namoli in the same neighbourhood; at 4,000 ft. May 11, 1906.

26924. Suket. May 16, 1906.

26955. Hills above Gere upon the east of Suket, at about 7,000 ft.; a region of woods of pines and oaks. May 17, 1906.

27047. Alsundi in the State of Suket at about 4,000 ft. May 20, 1906.

27075. Suni in the hot valley of the Sutlej at about 2,100 ft., and immediately north of Simla. May 21, 1906

27295. } Collected some time between June and August, 1906; no definite

27296. } information regarding locality available.

27542. Green film from cut surface of jute stumps exuding water by root-pressure. Bardwan in the Bengal plain, Sept. 15, 1906. (This consisted chiefly of minute unicells, probably once motile, but so badly preserved that identification was impossible. N.C.)

24918. From the north side of the very wet mountain of Tonglu at 9,500 ft. Oct. 2, 1906.
27737. From the mountain of Tonglu at 10,000 ft. Oct. 2, 1906.
27701. From a shallow pond on the water-parting at 11,600 ft., to the north of Sandakphu. Oct. 1, 1906.
27643. From a running stream in forest of *Abies Webbiana* between Sandakphu and Phallut at 11,000 ft. Sept. 28, 1906.
27959. Between Naya and Nataran on the Pichoung at the northern edge of the Akyab district, a region of forests. Jan. 5, 1907.
27976. Near Nataran. Jan. 7, 1907.
28013. Yinma on the Kalapanzin river, in the north-west of the Akyab district. Jan. 13, 1907.
28018. From a cliff over the River Kalapanzin; sandstone. Jan. 14, 1907.
28039. Pethadu, in the north-west of the Akyab district. Jan. 15, 1907.
28059. Akyab. 1907.
28064. Chittagong. 1907.
28179. River near Bhainsa Duban.
28180. Near Pursona in the Nepal Terai.
28183. Dadar, Bombay. 1908.
28134. Green Alga which is very hardy in Calcutta. 1908.
28683. From rocks in streams at Matiana on the so-called Tibetan road which goes into the interior of the Himalayas from Simla; altitude 8,500 ft. April 30, 1907.
28684. From a shaded pool at 8,500 ft. above Matiana. Date as previous number.
28697. From Theog on the same road at 8,300 ft. April 28.
28825. From a dirty pond, yellow with clay, at Mahasu on the same road. Collected by Dr. Annandale.
28842. From near Kakarhatti at various springs between 2,500 and 2,800 ft. May 9, 1907.
28857. From near Kasauli, in pools along a rocky streamlet which doubtless runs dry upon the face of the hills over the plains. May 11, 1907.
29361. Raxaul on the Nepal border; from a stream. Nov. 25, 1907.
29904. From the cold snow-water of the Trisuli river under Niakot, Nepal. Dec. 11, 1907.
30294. Dawna Hills, scrapings off wet rocks, at about 2,000 ft. March 3, 1908.
30346. Summit of the Dawna Hills at about 3,000 ft., from a damp rock facing north. March 4, 1908.

30372. Kawkareik, at the foot of the Dawna Hills; algae from floating leaves in a marsh on the west side of Kawkareik. March 25, 1908.
30607. Pa-gnat, south of Amherst, from a pond on the edge of saline rice land. March 12, 1908.
30636. Moulmein, in the waterworks. March 19, 1908.
31090. From stream about to dry up on the east face of Asingrah Hill. Sept. 27, 1908.
31099. From Chandai, in a running stream at the base of the hill. Sept. 28, 1908.
31345. From water under rocks at Sembadew in the Sipna valley. Oct. 18, 1909.
31268. In the Sipna stream. Oct. 10, 1909.
32700. On the crest of the pass, Haflong. Alt. 2,200 ft. Aug. 28, 1909.
32671. Washings from *Ceratophyllum*, R. Kundil, near Sadiya in the Assam valley. Middle of Aug. 1909.
32672. Washings from *Lemna* and *Wolffia*. Locality and date as the preceding number.
32658. Ditches of still water. Date and locality as before.
32683. From ditch at edge of rice field. Date and locality the same. (The altitude of Nos. 32671, 32672, 32658 and 32683 is about 400 ft.)
33018. Haflong in the Jatinga valley. Altitude 2,000 ft. In fairly permanent stream. Aug. 28, 1909.
33019. In running water of a less permanent nature. Same date and locality as the preceding number.
33044. From running water near Jatinga station, altitude 1,800 ft. Aug. 29, 1909.
- 33045 } At a distance of 10 yds. within the tunnel at Jatinga station.
33046 } Aug. 29, 1909.
33047. Haflong in the North Cachar Hills at 1,800 ft. in slowly running water upon the side of the railway line. Aug. 29, 1909.
36169. From small stream under Pongging in the Abor Hills at 700 ft. Jan. 21, 1912. (*Oocardium stratum* N.C.)
36212. From trunks, in oak forest at 5,500 ft. upon the water parting between the Serpe and Igar streams. Jan. 23, 1912.
36239. From earth in forest at 4,500 ft. in the hills south of Rotung. Jan. 24, 1912. (This number consists entirely of moss-protonema; I am deeply indebted to Dr. F. E. Fritch for kindly confirming my decision on this point. N.C.)
37400. From the River Dihang under Rotung at 700 ft. Jan. 25, 1912.
37689. From the River Dihang between Puak and its tributary the Side river at 900 ft. Jan. 5, 1912.

SYSTEMATIC.

MYXOPHYCEAE.

CHROOCOCCACEAE.

Genus *Chroococcus* Näg.

1. *C. turgidus* (Kütz.) Näg.
Var. *fuscescens* (Kütz.) Forti in De Toni, Syll. Alg. 5, p. 13, 1907.
Hab. (25390).

Genus *Gloeocapsa* Kütz.

2. *G. polydermatia* (Kütz.) De Toni, Syll. Alg. 5, p. 51, 1907.
Hab. Wet rocks at 2,000 ft., Dawna Hills (30294).

Genus *Merismopedia* Meyen.

3. *M. elegans* A. Br. in Kütz. Spec. Alg. 1849, p. 472.
Hab. Suket (26924); River Dihang, under Rotung (37400).

OSCILLATORIACEAE.

Genus *Oscillatoria* Vauch.

4. *O. violacea* (Walroth) Hass. De Toni, Syll. Alg. 5, p. 179, 1907.
Hab. In stream just about to dry up. Asirgarh Hill (31090).

Genus *Lyngbya* Ag.

5. *L. Loriae* Forti in De Toni, Syll. Alg. 5, p. 286, 1907.
Diam. fil. 2.5-3.5 μ ; diam. trich. 1.8-2.5 μ ; long. artic. 2.5-5 μ .
Hab. Forming a stratum on mud in running water near Jatinga station (33044).

Genus *Symploca* Kütz.

6. *S. thermalis* (Kütz.) Rabenh. Flor. Eur. Alg. II, 1868, p. 153.
Diam. fil. 2.25 μ ; diam. trich. 1 μ ; long. artic. 1.5-3.5 μ .
Hab. Namoli, at 4,000 ft. (26880); amongst mosses on the Mountain of Tonglu at 10,000 ft. (27737). Not present in sufficient quantity for certain determination.

NOSTOCHACEAE.

Genus *Anabaena* Bory.

7. *A. oscillarioides* Bory, 1822, Forti in De Toni, Syll. Alg. 5, 1907, p. 451.
 Hab. In rice field near Sadiya (32683).

Genus *Microchaete* Thur.

8. *M. uberrima* sp. nov. Pl. I, figs. 1-3.

Filis elongatis, usque 5 mms. longis, absolute cylindræis, basi breviter decumbentibus, stellato-fasciculatis, trichomatibus bruneolis, diametro 10-14 μ , cellulis plerumque subquadratis, vaginis solidis diametro 16-18 μ , fusciscentibus, heterocystis basalibus intercalaribusque, his cylindræis, illis sphaericis vel leviter depressis, sporis longe seriatis olivaceis, quadratis vel subcylindricis.

Hab. Sadiya, in ditch at edge of rice field (32683).

- Forma minor n. f. Pl. I, fig. 4.

Filamentis gracillioribus, diametro 9-11 μ , trichomatibus diametro 6.5-8 μ .

Hab. With the typical form (32683).

This species occurred in great quantity amongst *Spirogyra* and *Oedogonium* spp. It was forming spores in great quantity, entire filaments being so transformed at once (Pl. I, f. 2). The spores had a very distinct wall, and granular contents. The filaments were of great length, and showed no sign of attenuation. The intercalary heterocysts are peculiarly angular, and the vegetative cells on either side are attenuated towards it in a characteristic way. It is nearest to *M. robusta* Setchell and Gardner 1903, but differs in the apex of the filament, the cells of which are neither shortened nor torulose, nor do they differ in colour from the rest of the filament. There is also a difference in the sheath, which is brownish, and quite homogeneous.

SCYTONEMACEAE.

Genus *Plectonema* Thur.

9. *P. Thomasianum* (Kütz.) Born. in Bull. Soc. bot. de France xxxv, p. 155; Forti in De Toni Syll. Alg. 5, 1907, p. 490.
 Hab. In temporary stream, Haflong in the Jatinga Valley. Alt. 2,000 ft. (33019). Identification uncertain since specimen had been dried for some years and could not be restored to a satisfactory condition.

Genus *Scytonema* Ag.

10. *S. subtile* Moeb. in Flora, 1892, p. 448.

Hab. Mountain of Tonglu at 10,000 ft. (27737).

The specimens only differed from the Australian ones of Moebius in that the sheath was distinctly yellow instead of colourless.

11. *Scytonema* sp.

Crass. fil. 5 μ ; crass. trich. 2 μ . ad apicem 3 μ ; cellulis diametro ca. 6-plo longioribus, ad apicem quadratis.

Hab. With the preceding species (27737).

This Alga seems nearest to *S. tenuissimum* Schmidle (Alg. New Guinea, 1900), but differs in several respects. It was forming minute erect fascicles amongst mosses, dark-brown in colour and about 2mm. high. The sheaths of the filaments were colourless, and the trichomes yellowish-green. The branches were not frequent but usually in pairs. Heterocysts were also rare and were $1\frac{1}{2}$ times to twice longer than broad. The sheaths were perfectly smooth and showed no sign of being encrusted with lime. The Alga may be new, but was not sufficiently abundant to describe accurately.

STIGONEMACEAE.

Genus *Stigonema* Ag.

12. *S. hormoides* (Kütz.) Born. & Flah. Rev. III, p. 68.

Hab. Suket (26924); with the preceding species (27737).

RIVULARIACEAE.

Genus *Calothrix* Ag.

13. *Calothrix* sp.

Hab. Shady pool above Matiana at 8,500 ft. (28684).

The specimens were fragmentary, scattered amongst other Algae and insufficient for determination.

BACILLARIAE.

MELOSIRACEAE.

Genus *Melosira* Ag.

14. *M. varians* Ag. 1830 W. Sm. Brit. Diat. II, p. 57.

Hab. In springs near Kakarhatti between 2,500 and 2,800 ft. (28842); in the Dihang River, between Puak and its tributary the Side River (37689).

DIATOMACEAE.

Genus *Diatoma* D.C.

15. *D. hemale* (Lyngb.) Heiv. Van. Heurck Synops. t. 51, f. 1, 2.
 Var. *mesodon* Kütz. Van Heurck Synops. t. 51, f. 3, 4. (*Odontidium mesodon* Kütz.)
 Hab. On the wet Mountain of Tonglu at 9,500 ft. (24918); in shady pool at Matiana at 8,500 ft. (28684).

FRAGILLARIACEAE.

Genus *Fragillaria* Lyngbya.

16. *F. capucina* Desm. Van. Heurck Synops. t. 45, f. 2.
 Var. *mesolepta* (Rabenh.) Van Heurck Synops. t. 45, f. 3.
 Hab. In the River Dihang, between Puak and its tributary the Side River (37689).
 17. *F. Ungeriana* Grun. in Schmitz Atlas t. 298, f. 1-8.
 Hab. In various streams near Kakarhatti (28842); in stream about to dry up, Asirgarh Hill (31090); in running stream near base of the hill, Chandni (31099); in the Sipna stream (31268); in water under rocks, Sembadew, in the Sipna Valley (31345).

The isolated frustules of this Diatom bear a strong resemblance to *Synedra Ulna*, but the striations are much coarser. Very abundant as ribbon-like colonies.

Genus *Synedra* Ehrenb.

17. *S. Ulna* (Nitzsch) Ehr. Inf. 1838, p. 211, t. 17, f. 1; Rabenh. Flor. Eur. Alg. 1, 1864, p. 133.
 Hab. Alsundi in the State of Suket, 7,000 ft. (27047); damp rocks at the summit of the Dawna Hills at 3,000 ft. (30346); in the Sipna stream (31268); in the Dihang River, between Puak and its tributary the Side River (37689).
 Var. *longissima* (W. Sm.) Van Heurck Synops. t. 38, f. 3.
 Hab. Near Nataran (27976); with the typical form (37869).
 18. *S. acus* (Kütz.) Grun. in Abh. d. k. k. zool. botan. Gesellsch. Wien xii, 1862, p. 398.
 Hab. With the preceding species (31268, 37689).

EUNOTIACEAE.

Genus *Eunotia* Ehr.

19. *E. lunaris* (Ehr.) Grun. in Van Heurck Synops. Diat. p. 144, t. 35, f. 3-4, 6. (*Synedra lunaris* Ehr. W. Sm. Brit. Diat. 1, p. 69, t. 11, f. 82.)
Var. *maxima* Meister, Kieselalg. Schweiz, 1912, p. 83, t. x, f. 1.
Hab. Ditch at edge of rice field, near Sadiya (32683).
20. *E. pectinatis* (Dillw.) Rabenh. Flor. Eur. Alg. 1, 1864, p. 73 (*Himantidium pectinalis* Kütz. Bacill. t. 16, f. 2).
Hab. Mountain of Tonglu at 10,000 ft. (27737).
21. *E. praerupta* Ehrenb.
Var. *bidens* (Ehrenb.) Grun. (*Eunotia bidens*) W. Sm.
Hab. Ditch at edge of rice field, near Sadiya (32683).
22. *E. impressa* Ehr. 1854. Meister, Kieselalg. Schweiz, 1912, p. 85, t. x, f. 5.
Hab. With the preceding species (32683).
23. *E. major* (W. Sm.) Rabenh. Van Heurck Synops. t. 34, f. 14.
Hab. With the preceding species (32683).
24. *E. gracilis* (Ehr.) Rabenh. Van Heurck Synops. t. 33, f. 1 and 2.
Hab. With the preceding species (32683).

Genus *Desmogonium* Grun.

25. *D. Rabenhorstianum* Grun. Diat. u. Desm. Insel Banka. p. 6, t. 1, f. 1.
Long. frust. 150 μ ; lat. 6 μ .
Hab. In shallow still water, Haflong (32700).

The peculiar branched colonies of this Diatom were quite frequent. The frustules were slightly curved, not in the least capitate at the apex, and the marginal granules were not nearly as prominent as figured by Grunow.

ACHNANTHACEAE.

Genus *Achnanthes* Bory.

26. *A. Blasoettiana* Grun. Van Heurck Synops. t. 27, f. 27, 28.
Hab. In the River Dihang between Puak and its tributary the Side River (37689).

COCconeIDACEAE.

Genus *Cocconeis* Ehrenb.

27. *C. Placentula* Ehr. Infus. 1838, p. 194.
 Hab. In the River Dihang under Rotung (37400).

NAVICULACEAE.

Genus *Navicula* Bory.

28. *N. lata* Bréb.
 Var. *latistriata* (Greg.) Cl. Synops. II, p. 81.
 Hab. In shallow still water, Haflong, at 2,400 ft. (32700).
29. *N. stauroptera* Grun. Van Heurck Synops. t. 5, f. 7.
 Var. *interrupta* Cl. Synops. II p. 83; Van Heurck Synops. t. 6, f. 7.
 Hab. On the Mountain of Tonglu at 10,000 ft. (27737); in shallow still water at 2,400 ft., Haflong (32700); in ditch at edge of rice field near Sadiya, 400 ft. (32683).
30. *N. brevirostrata* Cl. Diat. Finl. p. 25, t. 1, f. 5.
 Hab. In ditch at edge of rice field near Sadiya (32683).
31. *N. acrosphaeria* Bréb. Cl. Synops. II, p. 86.
 Hab. In the Sipna Stream (31268).
32. *N. Brebissonia* Kütz. Van Heurck Synops. t. 5, f. 7.
 Hab. Near Kakarhatti (28842).
33. *N. hemiptera* Kütz. Bacill. p. 97, t. 30, f. 11. (*Pinnularia hemiptera* Rabenh. Cl. Synops. II, p. 85.)
 Hab. In ditch near Sadiya (32683).
34. *N. radiosa* Kütz.
 Var. *tenella* (Bréb.) Van Heurck Synops. p. 84, t. 7, f. 21-22.
 Hab. In stream about to dry up, Asirgarh Hill (31090); in the River Dihang between Puak and its tributary the Side River (37689).
35. *N. lanceolata* Kütz. Van Heurck Synops. t. 8, f. 16.
 Var. *Cymbula* Cl. Synops. II, p. 22.
 Hab. On the Mountain of Tonglu at 10,000 ft. (27737).
36. *N. exilis* Grun. Van Heurck Synops. t. 12, f. 11, 12.
 Hab. In shallow still water, Haflong, at 2,400 ft. (32700); in ditch by side of rice field near Sadiya (32683).
37. *N. Iridis* Ehr.
 Hab. In shallow still water, Haflong, at 2,400 ft. (32700); in the River Dihang between Puak and its tributary the Side River (37689).
 Var. *amphigomphus* Ehr. Van Heurck Synops. t. 13, f. 2.
 Hab. Near Kakarhatti (28842).

38. *N. Pupula* Kütz.
Hab. In the River Dihang (37689).
39. *N. confervacea* (Kütz.) Grun. Van Heurck Synops. t. 14, f. 36.
Hab. On the Mountain of Tonglu at 10000 ft. (27737); in the river near Bhainsa Duban (28179); in stream on Asirgarh Hill (31090); in the Sipna stream (31268).
40. *N. ovalis* Schmidt's Atlas t. 7, f. 33-36.
Var. *pumila* Grun. (*Diploneis ovalis* var. *pumila* Grun. 1882. Cl. Synops. 1, p. 92).
Hab. In water under rocks, Sembadew in the Sipna valley (31345)
41. *N. elliptica* Kütz Van Heurck Synops. t. 10, f. 10. (*Diploneis elliptica* Cl. Synops. I, p. 92.)
Hab. Near Kakarhatti (28842).

Genus *Stauroneis* Hass.

42. *S. Phoenicenteron* (Nitzsch) Ehr.
Var. *amphilepta* (Ehr.) Cl. Synops. 1, p. 149.
Hab. In ditch at edge of rice field near Sadiya (32683).
43. *S. anceps* Ehr. Van Heurck Synops t. 4, f. 4, 5.
Hab. In stream about to dry up on east face of Asirgarh Hill (31090); from Chandni near Base of Hill in running stream (31099); in the Sipna stream (31268).
Var. *amphicephala* (Kütz.) Cl. Synops. 1, p. 148.
Hab. In ditch at edge of rice field near Sadiya (32683).

GOMPHONEMACEAE.

Genus *Gomphonema* Ag.

44. *G. acuminatum* Ehr. Inf. 1838, t. 18, f. 4.
Var. *Turris* Ehr. 1843.
Hab. With the preceding species (32683).
45. *G. lanceolatum* Ehr. 1843.
Hab. With the preceding species (32683).
46. *G. sphaerophorum* Ehr. 1845.
Hab. In the River Dihang between Puak and its tributary the Side River (37689).
47. *G. subclavatum* Cl. Synops. 1, p. 183.
Hab. In water under rocks, Sembadew in the Sipna valley (31345); in the Sipna stream (31268).

COCOONEMACEAE.

Genus *Cocconema* Ehr.

48. *C. turgidula* Grun. Cl. Synops. 1, p. 171.
 Hab. In the River Dihang between Puak and its tributary the Side River (37689); in the River Dihang under Rotung (37400).
49. *C. cistula* Kirchn. Cl. Synops. 1, p. 173.
 Hab. With the preceding species (37689).
50. *C. obtusa* Greg. Van Heurck Synops. t. 3, f. 1a.
 Hab. With the preceding species (37689).
51. *C. affinis* Kütz. Van Heurck Synops. t. 1, f. 31.
 Hab. In springs near Kakarhatti (28842).
52. *C. gastroides* Kütz. Van Heurck Synops. t. 2, f. 8.
 Hab. In running stream, Chandni near base of hill (31099).
 Forma *minor* Van Heurck Synops. t. 2, f. 9.
 Hab. With the typical form (31099).
53. *C. tumida* Bréb. Van Heurck Synops. t. 2, f. 10.
 Hab. In water under rocks at Sembadewin the Sipna valley (31345); in the Sipna stream (31268).
54. *C. Reinhardtii* Grun. Cl. Synops. 1, p. 162.
 Hab. In running stream, Chandni; near base of the hill (31099).

Genus *Amphora* Ehr.

55. *A. ovalis* Kütz. Van Heurck Synops. t. 1, f. 1.
 Var. *gracilis* Van Heurck Synops. t. 1, f. 3.
 Hab. In stream about to dry up on east side of Asirgarh Hill (31090); in running stream, Chandni, near base of hill (31099).

Genus *Rhopalodia* O.M.

56. *R. gibba* O. M. (*Epithemia gibba* Kütz. Van Heurck, Synops. t. 32, f. 1, 2).
 Hab. Near Nataran (27976); in stream at Raxaul on the Nepa border (29361); in water under rocks, Sembadew in the Sipna valley (31345).

NITZSCHIACEAE.

Genus *Nitzschia* Hass.57. *N. linearis* (Ag.) S. Sm.

Hab. In the River Dihang under Rotung (37400).

58. *N. sinuata* (W. Sm.) Grun.

Var. *Tabellaria* Grun. Van Heurck Synops. t. 60, f. 12, 13.

Hab. In the River Dihang between Puak and its tributary the Side River (37689).

59. *N. amphibia* Grun. Van Heurck Synops. t. 68, f. 15-17.

Hab. With the preceding species (31345); in the Sipna stream (31268); in running stream, near base of the hill, Chandni (31099).

Genus *Hantzschia* Grun.60. *H. Amphioxys* (Ehr.) Grun Pl. 1, 16. Pl. 11, fig. 15.

Hab. From the Mountain of Tonglu (24918, 27737); from the River Dihang under Rotung (37400).

Zygospores quadratae, membrana ad angulos multa producta et incrassata. Long. sine pr. 18-40 μ , cum pr. 27-58 μ ; lat. 19-26 μ .

In no. 27737, this diatom was quite frequent in the conjugated condition. The zygote was more or less quadrate, with a greenish hyaline membrane conspicuously prolonged and thickened at the corners. These peg-like processes at the angles projected into the delicate and collapsed remains of the old walls of the conjugating individuals. The process did not seem to be accompanied by a conspicuous increase in size as in the formation of auxospores by conjugation, and the zygote with its appendages was very similar to that of some of the Saccoderm Desmids. In some cases, however, the characteristic form and markings of the Diatom could be recognised on the walls of the conjugating cells, so that there could be no doubt whatever as to its identity.

SURIRELLACEAE.

Genus *Surirella* Turp.[61. *S. apiculata* W. Sm. Schmidt's Atlas t. 23, f. 34, 35.

Hab. near Kakarhatti (28842).

CHLOROPHYCEAE.**VOLVOACEAE.****Genus Pandorina Bory.**

62. *P. morum* (Müll.) Bory. De Toni, Syll. Alg. 1, 1888, p. 539.

Hab. In ditch at edge of rice field near Sadiya (32683).

PALMELLACEAE.**Genus Hormotila Borzi.**

63. *H. tropica* G. S. West. (*Urococcus tropicus*) W. & G. S. W. in Ann. R. Bot. Gard. Calcutta, 1907, p. 227, t. 11, f. 17-21.

Hab. On wet rocks Dawna Hills (30294).

DICTYOSPHAERIACEAE.**Genus Westella De Wildeman.**

64. *Westella botryoides* (West) Schmidle (*Tetracoccus botryoides*) West Alg. Engl. Lake Distr. 1892, p. 735, t. x, f. 43-48.

Hab. In ditch at edge of rice field near Sadiya (32683).

AUTOSPORACEAE.**Genus Oocystis Näg.**

65. *O. solitaria* Wittr. in Wittr. and Nordst. Alg. Exc. 1879, No. 244; fasc. 21, 1889, p. 22, cum fig.

Hab. On the Mountain of Tonglu at 10000 ft. (27737).

Genus Nephrocytium Näg.

66. *N. Agardhianum* Näg. Gatt. einz. Alg. 1849, p. 80, t. 111c.

Hab. In ditch at edge of rice field near Sadiya (32683).

Genus *Tetraëdron* Kütz.67. *T. regulare* Kütz.

Var. *longispinum* Reinsch De Toni Syll. Alg. 1, 1888, p. 605.

Hab. With the preceding species (32683).

Genus *Ankistrodesmus* Corda.68. *A. falcatus* (Corda) Ralfs, Brit. Desm. 1848, p. 180, f. 3.

Var. *spiralis* (Turn.) West. (*Raphidium spirale*) Turn. Freshw. Alg. E. India, 1893, p. 156, t. 20, f. 26).

Hab. With the preceding species (32683).

Genus *Scenedesmus* Meyen.69. *S. bijugatus* (Turp.) Kütz.

Hab. With the preceding species (32683).

70. *S. quadricauda* (Turp.) Bréb. Alg. Falaise 1835, p. 66.

Hab. In shallow still water at Haflong (32700).

71. *S. obliquus* (Turp.) Kütz.

Hab. Ditches of still water near Sadiya (32658); living in watery fluid exuded by root-pressure from the cut stems of jute plant, near Bardwan in the Bengal plain (27543).

Genus *Coelastrum* Näg.72. *C. cambricum* Arch.

Hab. In ditch at edge of rice field near Sadiya (32683).

73. *C. microporum* Näg. in A. Br. Alg. unicell. 1855, p. 70.

Hab. With the preceding species (32683).

74. *C. morus* West Alg. C. Africa. 1896, p. 5, t. 361, f. 4.

Hab. In the River Dihang between Puak and its tributary the Side River (37698).

Colonies of 8 cells only were most frequent.

Genus *Sorastrum* Kütz.75. *S. spinulosum* Näg. Gatt. einz. Alg. 1849, p. 99, t. 5D.

Hab. In ditch at edge of rice field near Sadiya (32683).

HYDRODICTYACEAE.

Genus *Pediastrum* Meyen.

76. *P. tetras* (Ehr.) Ralfs in Ann. Mag. Nat. Hist. 14, 1844, p. 469, t. 12, f. 14.
Hab. In ditches of still water Sadiya (32658); with the preceding species (32683).
77. *P. simplex* Meyen, Rabenh. Flor. Eur. Alg. 111, 1868, p. 71.
Hab. In the Sipna stream (31268).

Genus *Hydrodictyon* Roth.

78. *H. reticulatum* (L.) Lagerh.
Hab. Suket (26924); in the warm water of the Tardi River near Niskot, Nepal (29940).

CLADOPHORACEAE.

Genus *Cladophora* Kütz.

79. *C. glomerata* (L.) Kütz.
Hab. In the cold snow water of the Trisuli River under Niskot, Nepal (29904).

Genus *Pithophora* Wittrock.

80. *P. radians* W. & G. S. West Alg. Ceylon 1902, p. 132.
Hab. At Dadar, Bombay (28183).
A form sterile but probably identical with the above species occurred in No. 37689.

Genus *Rhizoclonium* Kütz.

81. *R. hieroglyphicum* Kütz.
Hab. At Dadar, Bombay (28183),

ULVACEAE.

Genus *Monostroma* (Thur.) Wittr.82. *Monostroma* sp.

Hab. In the cold snow water of the Trisuli River (29904).

Specimen too fragmentary for accurate determination.

ULOTRICHACEAE.

Genus *Ulothrix* Kütz.83. *U. zonata* (Webb & Mohr) Aresch.

Diam. fil. 20-50 ; long. cell. 10-30.

Hab. From rocks in stream at Matiana (28683).

84. *U. subtilis* Kütz. Phyc. Germ. 1845, p. 197, Rabenh. Flor. Eur. Alg. 111, 1868, p. 365.

Var. *variabilis* (Kütz.) Kirchn.

Hab. In running water near Jatinga station and also 10 yards within the tunnel (33044, 33046) ; shallow water at Haflong (32700).

85. *U. aquatica* Kütz. Phyc. Germ. 1845, p. 197.

Hab. Running water near Jatinga station (33044).

Genus *Chaetophora* Schrank.86. *C. pistiformis* (Roth) Ag.

Hab. In the waterworks at Moulmein (30636).

TRENTEPOHLLIACEAE.

Genus *Trentepohlia* Mart.87. *T. dialepta* (Nyl.) Hariot in Journ. de Bot. 1889, p. 193 ; Schmidle in Flora 1897, p. 306.

Diam. fil. 8-12 μ ; cum hyphis fungi 12-15 μ ; long. cell. 25-33 μ .

Hab. On trunks of trees in oak forest at 5500 ft. on the waterparting between the Serpi and Igar streams (36212).

The Alga was sterile, but it agreed very well with Schmidle's description of *T. dialepta*. The plant mass was not quite so large as in Schmidle's Alga. the plates being only about 3 cms. in diameter and 1 mm. in thickness. The

branching and form of the filaments, however, were almost identical. It is noteworthy that Schmidle states that the branches arise opposite to each other, whereas Hariot says they arise chiefly on one side of the main filament. In the Indian specimens the branches were nearly always opposite and in pairs. The lichenized Alga is of the form of the Lichen *Coenogonium*, but no fructifications, neither of the Alga nor of the Fungus, were present.

APHANOCHAETACEAE.

Genus *Aphanochaete* A. Br.

88. *A. repens* A. Br. 1851.

Hab. In ditch at edge of rice field near Sadiya (32683).

COLEOCHAETACEAE.

Genus *Coleochaete* Bréb.

89. *C. orbicularis* Pringsheim.

Hab. On floating leaves in marsh, Kawkareik (30372); with the preceding species (32683).

ZYGNEMACEAE.

Genus *Mougiotia* Ag.

90. *M. laetevirens* (A. Br.) Wittr. (*Craterospermum laetevirens*) A. Br. 1885; DeBary Conj. 1858, p. 81, t. 3, f. 1-13.

Hab. In ditch at edge of rice field near Sadiya (32683).

91. *M. tenuis* (Cl.) Wittr. in Bihang till k. Svenska vet.—akad. Handl. 1872, p. 39.

Var. *minor* Wolle Freshw. Alg. U. St. 1887, p. 233, t. 148, f. 11-15.

Diam. fil. 17-19 μ ; long. cell. 120-150 μ ; diam. zyg. 27-30 μ .

Hab. With the preceding species (32683).

92. *M. producta* W. & G. S. West Alg. Burma, 1907, p. 188, t. 10, f. 16-19.

Hab. With the preceding species (32683).

The specimens were in conjugation, but no aplanospores were observed.

Genus *Debarya* Wittr.

93. *D. desmidioides* W. & G. S. West, Notes Alg. 3, 1903, p. 7, t. 446, f. 1-9.

Var. *orientale* var nov.

Pl. 11, figs. 17-20.

Var. *filis longis* nec facile dilabentibus, articulis parum constrictis, conjugationis tempore tantum in cellulas dissociatis.

Crass. cell. veg. 6-7 μ ; long. cell. 30-67 μ ; diam. zyg. 20-25 μ .

Hab. In shady pool above Matiana at 8500 ft. (28684).

The Alga was present in great quantity and was freely conjugating. The sterile filaments were often of great length, and the cells themselves long and slender, and only slightly convex at the apex. The structure of the cell was variable to some extent, but there were always two small pyrenoids in the middle of the cell, surrounded by the slightest film of chromatophore. The nucleus was sometimes inserted between the two pyrenoids as in *Zygnema*, but occasionally it was lateral in position. The appearance was usually more suggestive of *Zygnema* than of *Mougiotia*, but this may have been due in part to prolonged preservation in a poor fixing reagent.

During and after dissociation prior to conjugation the isolated cells were more like *Debarya desmidioides* as figured by W. & G. S. West, the ends of the cells becoming much more convex. The conjugating cells were exactly similar to the Cornish ones, the old gametangia undergoing the same changes, becoming glistening and apparently solid. Comparatively early stages in conjugation were most frequent, but one mature zygote with a golden-brown wall was observed.

It is extremely interesting that a form of a species originally described from Cornwall, should next be recorded at an altitude of 8500 ft. in the tropics

Genus *Zygnema* Ag.

94. *Z. pectinatum* (Vauch.) Ag.

Var. *decussatum* (Vauch.) Kirchn. *Forma* cf. Carter, Freshw. Alg.

New Cal. 1922, p. 65.

Crass. fil. veg. 16-18 μ ; diametro 2-4-plo longioribus; diam. zyg. 30-40 μ ,

Hab. (25390).

This Alga agreed almost exactly with that described and figured from New Caledonia. The cells were, however, slightly shorter and thicker, although conjugation was regularly lateral in the same way, scalariform conjugation occurring occasionally as a great rarity as in the earlier described Alga. The zygospores were rather better developed than before and showed a conspicuously scrobiculate membrane.

95. *Zygnema* sp.

Pl. 11, fig. 11.

Z. akinetis cylindricis instructum, membrana interiore akinetae fusci punctata, exteriori hyalina.

Diam. cell. veg. 22-23 μ ; long. cell. 38 μ ; diam. akin. 23 μ long. 38 μ .

Hab. In shallow still water Haflong at 2400 ft. (32700).

These asexual spores are somewhat similar to those figured by De Bary for *Z. pectinatum* (Conj. 1858, t. 1, f. 15). They are formed from the ordinary vegetative cells without any change of form or size, the mature spore being exactly similar to the ordinary cell except that there is an opaque and coarsely punctate wall underlying the original one, which remains hyaline and colourless. The cells during the formation of the spores become very slightly convex, so that the filament becomes disjointed into lengths of two or three cells each.

Another species of *Zygnema* but sterile, occurred with the preceding species in No. 32700.

Genus *Spirogyra* Link.

96. *S. inflata* (Vauch.) Rabenh. Petit Spir. env. Paris 1880, p. 7.

Crass. cell. veg. 16 μ ; long. zyg. 47-56 μ ; lat. zyg. 27 μ .

Hab. In the River Dihang, between Puak and its tributary the Side River (37689).

97. *S. reticulata* Nordst. in Botan. Notiser 1880, p. 118.

Crass. cell. veg. 28 μ ; long. zyg. 70 μ ; lat. zyg. 42 μ .

Hab. With the preceding species (37689).

98. *S. cateniformis* (Hass.) Kütz. Petit Spirogyra environ. Paris, 1880, p. 17.

Crass. cell. veg. 20 μ ; long. zyg. 46-49 μ ; lat. zyg. 25 μ .

Hab. With the preceding species (37689).

99. *S. porticulis* (Müll.) Cleve. Petit Spirogyra env. Paris, 1880, p. 21, t. 5, f. 8-12.

Hab. Between Naya and Nataran (27959); in stream about to dry up on east face of Asirgarh Hill (31090).

100. *S. neglecta* (Hass.) Kütz. Petit, Spirogyra env. Paris, 1880, p. 26, t. 9, f. 1-5.

Crass. cell. veg. 56 μ ; long. zyg. 70-80 μ ; lat. zyg. 54-58 μ .

Hab. - In pools in a rocky streamlet near Kasauli (28857).

101. *S. fluviatilis* Hilse. Petit Spirogyra env. Paris, 1880, p. 27, t. 5, f. 13; Wolle, Freshw. Alg. U. S., 1887, p. 216, t. 136, f. 1-3.

Crass. cell. veg. 40 μ ; long. 135-185 μ ; lat. zyg. 43-50 μ ; long. zyg. 70-80.

Hab. In various streams near Kakarhatti, 2500-2800 ft. (28842).

102. *S. Grossi* Schmidle in Allgemeine Botan. Zeitschr. 1901, p. 3. (sep.)

Lat. cell. veg. 43-50 μ ; diam. 2-3 plo longioribus; lat. zyg. 63 μ ; long. 87 μ ; diam. cell fruct. 80 μ

Hab. At Pethadu (28039); in stream just about to dry up on east face of Asirgarh Hill (31090).

This peculiar species was fruiting abundantly in No. 31090, but the zygospores were unfortunately very immature.* The vegetative cell has three or four chloroplasts with two to two and a half turns and the cell becomes very swollen. The alga in No. 31090 was very similar to *S. Grossi* Schmidle, but the vegetative cells are a little wider, as are also the fruiting cells. The zygospores in this sample were also too young to show the character of the wall described by Schmidle. The Alga in No. 28039 was more typical.

103. *S. orthospira* (Nag.) Kütz. Petit, *Spirogyra* env. Paris. 1880, p. 30.

Crass. cell. veg. 65μ ; diam. zyg. 65μ .

Hab. In ditch at edge of rice field near Sadiya (32683).

104. *S. maxima* (Hass.) Wittr. (*S. orbicularis* Hass.) Kütz. in Petit, *Spirogyra* env. Paris 1880, p. 31.

Crass. cell. veg. 90-100 μ ; diam. zyg. 110 μ .

Hab. (27295); in ditch near Sadiya (32658).

Other species of *Spirogyra* were observed in Nos. 26847, 28179, 32658, 33018, and 37689.

DESMIDIACEAE.

Genus *Gonatozygon* De Bary.

105. *G. Kinahani* (Arch.) Rabenh. Alg. Bur. III, 1868, p. 156; W. & G. S.

West, Brit. Desm. 1, p. 35. (*Leptocystinema Kinahani* Arch. Suppl.

Cat. Desm. 1852, p. 243, 250, t. 21, f. 1-4.)

Hab. In ditch at edge of rice field near Sadiya (32683).

Genus *Cylindrocystis* Menegh.

106. *C. Brebissonii* Menegh. 1838. W. & G. S. West, Brit. Desm. 1904, p. 58, t. 4, f. 23-32. (*Penium Brebissonii* Ralfs, 1848.)

Hab. In shallow still water, Hailong (32700); on the Mountain of Tonglu at 10,000 ft. (27737).

107. *C. crassa* De Bary Conj. 1858, W. & G. S. West, Brit. Desm. 1904, p. 59, t. 4, f. 33-38.

Hab. With the preceding species (27737).

Genus *Netrium* Näg.

108. *N. Digtas* (Ehr.) Itzigs. & Rothe. W. & G. S. West, Brit. Desm. 1904, p. 64.

Hab. (25390).

Genus *Pentium* Breb.

109. *P. Clevei* Lund. Desm. Suec. 1871, p. 86, t. 5, f. 11; W. & G. S. West, Brit. Desm. 1904, p. 87.
 Long. 76 μ ; lat. 25 μ ; lat. isthm. 21 μ .
 Hab. In ditch at edge of rice field near Sadiya (32683).

Genus *Closterium* Nitzsch.

110. *C. Libellula* Focke 1847.
 Var. *intermedium* Roy & Biss. Scott. Desm. 1894, p. 252; W. & G. S. West, Brit. Desm. 1904, p. 74.
 Hab. In still water, Haflong (32700).
 111. *C. parvulum* Näg. 1849; W. & G. S. West, Brit. Desm. 1904, p. 133.
 Lat. 20 μ ; apicibus 157 μ inter se distantibus; lat. apic. 2 μ .
 Hab. In ditch at edge of rice field near Sadiya (32683).
 112. *C. acerosum* (Schrank) Ehr. W. & G. S. West, Brit. Desm. 1904, p. 146.
 Hab. Suket (26924).
 Var. *angolense* W. & G. S. West, Brit. Desm. 1904, p. 149.
 Hab. With the typical form (26924).
 113. *C. abruptum* W. & G. S. West, Brit. Desm. 1904, p. 158.
 Lat. 22 μ ; apicibus 190 μ inter se distantibus; lat. apic. 7 μ .
 Hab. In ditch near Sadiya (32700).
 114. *C. calsporum* Wittr. Skand. Desm. 1869, p. 23, t. 1, f. 11; W. & G. S. West, Brit. Desm. 1904, p. 138.
 Lat. 9 μ ; apicibus 80 μ inter se distantibus.
 Hab. In ditch at edge of rice field near Sadiya (32683).

Genus *Pleurotaenium* Näg.

115. *P. Trabecula* (Ehr.) Näg. 1849; W. & G. S. West, Brit. Desm. 1904, p. 209.
 Var. *clavata* (Kütz.) W. & G. S. West Brit. Desm. 1904, p. 211 (*Docidium clavatum* Kütz. Ralfs Brit. Desm. 1848, p. 156, t. 26, f. 3).
 Hab. Non-permanent stream, Haflong in the Jatinga valley (33019).
 116. *P. irregulare* (Turn.) mihi. (*Docidium irregulare* Turn. Freshw. Alg. E. India 1893, p. 33.)
 Hab. In ditch at edge of rice field near Sadiya (32683).

The specimens were not absolutely identical with Turner's description, the apical one-third of the semicells being free from undulations, and the cell-wall fairly distinctly scrobiculate. Otherwise they were quite similar.

117. *P. tessellatum* (Josh.) Lagerh. Kritische Bemerk. 1887, p. 541 (*Docidium tessellatum* Josh. Burm. Desm. 1885, p. 650).

Long. 400 μ ; lat. 40 μ ; lat. apic. 25 μ .

Hab. With the preceding species (32683).

The question has been raised whether *P. tessellatum* (Josh.) Lagerh. is identical with *P. trochiscum* W. & G. S. West (some N. Amer. Desm. 1896, p. 225; Alg. Burma 1907, p. 195). In view of the fact that the present specimens were exactly similar to the Alga described by Joshua, this seems very improbable. The Alga from Sadiya had no basal inflation at all, and, as in Joshua's figure, the semicells were gradually attenuated from base to apex.

118. *P. cristatum* (Turn.) Borge, Trop. u. subtrop. Süßw. Chlor. 1899, f. 15. (*Docidium cristatum* Turn. Freshw. Alg. E. India 1893, p. 32, t. 4, f. 7.)

Forma orientalis (Turn.) W. & G. S. West. Alg. Burma 1907, p. 195, (*Docidium orientale* Turn. Freshw. Alg. India 1893, p. 31, t. 4, f. 1.)

Hab. With the preceding species. (32683).

119. *P. maculatum* (Turn.) nihi. (*Docidium maculatum* Turn. Freshw. Alg. E. India 1893, p. 31, t. 4, f. 3.) Pl. 1, fig. 25.

Zygosporis magnis globosis, diametro 150 μ , membrana laevi, tegumento globoso gelatinoso crasso involuta vestitis; diam. teg. 320-380 μ .

Long. ca 620 μ ; lat. bas. 60 μ ; lat. apic. 53 μ ; diam. zyg. 150 μ ; cum teg. gel. ca 360 μ .

The specimens agreed very well with Turner's description, except that the punctae of the cell-wall were more distant. These, according to Turner are 2-2.3 μ apart, but according to his figure, they are at least 4-5 μ distant. The present specimens agreed with his figure rather than his description in this respect. The cells are also found adhering together to form filaments 3 or 4 individuals long. Zygosporis were not infrequent in No. 32683. The conjugating cells often had one very young semicell.

Hab. In ditches of still water, near Sadiya (32658); in ditch at edge of rice field (32683).

120. *P. firmum* W. & G. S. West, Alg. Mad. 1895, p. 15, t. 5, f. 41.

Var. *cylindricum* Var. nov.

Var. *cellulis gracilioribus*, diametro circiter 9-13-plo longioribus, membrana punctis distantioribus praedita.

Long. 550-780 μ ; lat. 50-61 μ ; lat. ad apic. 38-40 μ .

Hab. With the preceding species (32683, 32658); in washings of *Lemna* and *Wolffia* from R. Kundit near Sadiya (32672).

Genus Euastrum Ehrenb.

121. *E. ansatum* Ralfs Brit. Desm. 1848, p. 85, t. 14, f. 2.

Hab. In ditch at edge of rice field near Sadiya (32683).

- Var. *pyxidatum* Delp. Desm. subalp. 1873, p. 103, t. 6, f. 32-34; W. & G. S. West, Brit. Desm. 1905, p. 29.
 Hab. With the typical form (32683).
122. *E. spinulosum* Delp. Desm. subalp. 1873, p. 97.
 Subspec. *africanum* Nordst. De Alg. et Char. 1880, p. 9, t. 1, f. 16;
 W. & G. S. West, Freshw. Alg. Ceylon 1902, p. 149, t. 19, f. 21.
 Hab. In non-permanent water, Haflong in the Jatinga valley (35019).
 Var. *ceylonicum* W. & G. S. West, Freshw. Alg. Ceylon, 1902, p. 149,
 t. 19, f. 20.
 Hab. In ditch at edge of rice field near Sadiya (32683).
123. *E. coralloides* Josh. Burmesc Alg. 1886, p. 639, t. 23, f. 10.
 Hab. With the preceding species (32683).
124. *E. pulchellum* W. & G. S. West, Freshw. Alg. Ceylon, 1902, p. 153,
 t. 20, f. 11.
 Var. *divisum* W. & G. S. West, Freshw. Alg. Burma, 1907, p. 198, t.
 14, f. 7.
 Hab. With the preceding species (32683).
125. *E. binale* (Turp.) Ehr. W. & G. S. West, Brit. Desm. 1905, p. 51.
 Forma *secta* Turn. Freshw. Alg. E. India 1893, p. 81; W. & G. S. West,
 Brit. Desm. 1905, p. 53.
 Hab. Shallow still water, Haflong (32700).
126. *E. sinuosum* Lenorm. Ralfs Brit. Desm. 1848, p. 85; W. & G. S. West,
 Brit. Desm. 1905, p. 20.
 Hab. With the preceding species (32700).
127. *E. bellum* Nordst. Desm. Brasil, t. 11, f. 6.
 Var. *madagascariense* W. & G. S. West. Freshw. Alg. Mad. 1895, p. 49,
 t. 6, f. 7.
 Hab. In ditch at edge of rice field near Sadiya (32683).
128. *E. longicollis* Nordst. Freshw. Alg. New Zeal. 1888, p. 33, t. 3, f. 5.
 Hab. With the preceding species (32683).
 Var. *capitatum* W. & G. S. West, Freshw. Alg. Ceylon, 1902, p. 148,
 t. 19, f. 24.
 Hab. With the typical form (32683).
- The characters of the variety although distinctly present, were not so pronounced as in the specimens from Ceylon.
129. *E. fissum* W. & G. S. West, Freshw. Alg. Ceylon 1902, p. 154, t. 20,
 f. 17.
 Hab. With the preceding species (32683).
130. *E. denticulatum* (Kirchn.) Gay. Note Conj. midi de France, 1884, p.
 335; W. & G. S. West, Brit. Desm. 1905, p. 55, t. 39, f. 1-4.
 Hab. With the preceding species (32683).

Genus *Euastridium* W. & G. S. West.131. *E. staurastroides* sp. nov.

Pl. I, fig. 26.

E. magnum, circiter $1\frac{1}{2}$ -plo longius quam latum, profunde constrictum, sinu lineari angusto; semicellulis trilobatis, lobi lateralibus semicircularibus, lobo polari subrectangulari ad basin constricto, angulis late rotundatis, apice refuso, tumore mediano instructo, duobus quoque supra isthmum sitis, semicellulis a vertice visis triangularibus, angulis late rotundatis et bilobatis, lateribus retusis; lobo polari triangulari angulis eis basis semicellularum alternantibus lateribus retusis; membrana dense scrobiculata, scrobiculis super lobos semicellularum multo majoribus.

Long. 98μ ; lat. 59μ ; lat. lob. pol. 35μ ; lat. isthm. 25μ .

Hab. In ditch at edge of rice field, Sadiya, rare (32683).

Only a few specimens of this species were observed, but the characters seemed very distinctive and sufficiently definite for them to be referred to the genus *Euastridium* as a new species. *E. staurastroides* differs from the first described species of the genus, namely *E. Prainii* W. & G. S. West in its triradial symmetry, in the greater relative size of the polar lobe, and also in its narrow closed sinus. Otherwise the resemblance between the two species is most striking. The discovery of this new species of *Euastridium* gives another indication of the difficulties experienced in drawing sharp lines between the genera of this family, for besides possessing some of the characters of *Micrasterias* and *Euastrum*, *Euastridium* has also something in common with *Staurastrum*. This is perhaps more striking in *Euastridium staurastroides*, with its trigonal symmetry than in *E. Prainii*. In fact, as regards the actual form of the cell, *E. staurastroides* is very similar to *Staurastrum acarides* Nordst. The discovery of this new species, with different characters necessitates a revision of the generic characters.

Euastridium W. & G. S. West char. emend.

Cellulae iis *Euastrii* subsimiles sed non compressae, sinu angusto vel aperto, sine incisura apicali; semicellulae a fronte visae subtrilobatae, apice refuso; a latere visae ut a fronte visae, a vertice visae actinomorphicae, 3-8 lobatae.

Genus *Micrasterias* Ag.132. *M. foliacea* Bail. in Raffa Brit. Desm. 1848, p. 210, t. 35, f. 3: Johnson, Spec. Mier., 1894, p. 57, t. 6, f. 1-4.

Long. 70μ ; lat. 71μ ; lat. lob. pol. 32μ .

Hab. With the preceding species (32683).

133. *M. Moeblii* (Borge) W. & G. S. West, Desm. Singapore 1897, p. 162.
 Var. *Burmense*, W. & G. S. West, Freshw. Alg. Burma 1907, p. 201, t. 14, f. 19, 20.
 Long. 103μ ; lat. 82μ ; lat. lob. pol. $62-66\mu$; latisthm. 33μ .
 Hab. With the preceding species (32683).
134. *M. pinnatifida* (Kütz.) Ralfs, W. & G. S. West, Brit. Desm. 1905, p. 80.
 Hab. At Chittagong (28064).
135. *M. incisa* Bréb. in Ralfs Brit. Desm. 1848, p. 211; in Kütz. Phyc. Germ. 1845, p. 134, Turn. Freshw. Alg. E. India, 1893, p. 89, t. 6, f. 8, 10.
 (*Holocystis incisa* Wallich Desm. low. Bengal 1860, p. 276, t. 13, f. 4, 5).
 Hab. With the preceding species (32683).
 Var. *Wallichiana* Turn. Freshw. Alg. E. India 1893, p. 89, t. 6, f. 7, 9.
 Hab. With the typical form (32683).
 The variety was much more frequent than the type.
136. *M. Crux-melitensis* (Ehr.) Hass. Ralfs Brit. Desm. 1848, p. 73, t. 9, f. 3; W. & G. S. West, Brit. Desm. 1905, p. 116.
 Long. 92μ ; lat. 92μ ; lat. isthm. 16μ .
 Hab. On ditch at edge of rice field near Sadiya (32683).
137. *M. Mahabuleshwariensis* Hobson in Quart. Journ. Micr. Sci. 1863, p. 168.
 Var. *Wallichii* (Grun.) W. & G. S. West Brit. Desm. 1905, p. 122 (*M. Wallichii* Grun. 1865).
 Forma *bengalica* (Lagerh.) mihi (*M. ampullacea* Mask. var. *bengalica* Lagerh. Desm. Bengal 1888, p. 5, t. 1, f. 2.)
 Hab. With the preceding species (32683).
 The specimens were considerably smaller than those of Lagerheim, and the two central protuberances rather more distant.

Genus *Cosmarium* Corda.

138. *C. pseudoretoides* Ström, Freshw. Alg. Tuddal 1919, p. 31, t. 3, f. 7, 8.
 (*Cylindrocystis minutissima* Turn. Freshw. Alg. E. India, 1893, p. 16, t. 1, f. 24; W. & G. S. West, Brit. Desm. 1904, p. 62).
 Long. 15μ ; lat. 6.5μ .
 Hab. On the Mountain of Tonglu at 10,000 ft. (27737).
139. *C. cruciferum* DeBary 1858; Rabenh. Flor. Eur. Alg. 111, 1868, p. 177:
 (*Penium cruciferum* (DeBary) Wittr. in W. & G. S. West, Brit. Desm. 1904, p. 100).
 Hab. With the preceding species (27737).
140. *C. subpyramidatum* (W. & G. S. W.) Lütke. Gatt. Cyl. 1913 (*Cylindrocystis subpyramidata* W. & G. S. West Freshw. Chlor. Koh Chang 1901, p. 78, t. II, f. 8-11.).
 Hab. In shallow still water, Haifong (32700).

141. *C. curtum* (Breb.) mihi (*Dysphinctum curtum* (Breb.) Näg. Lütke. Kennt. Gatt.; Pen. 1905, p. 337.) *Penium curtum* Bréb. W. & G. S. West, Brit. Desm. 1904, p. 97.
Hab. In shady pool at 8,500 ft. above Matiana (28684).
142. *C. diplosporum* (Lund.) Lütke. Gatt. Cyl. 1913, p. 227. (*Cylindrocystis diplospora* Lund. W. & G. S. West Brit. Desm. 1904, p. 61).
Hab. In stream at Raxaul on the Nepal border (29361).
143. *C. australe* (Racib.) Lütke. Kenntn. Gatt. Penium 1905, p. 337 (sub nomine *Dysphinctum* Näg. *Penium australe* Racib Desm. Ciast. 1892, p. 367, t. 6, f. 27).
Hab. In shallow still water, Haflong (32700); in ditch at edge of rice field near Sadiya (32683).
144. *C. minimum* W. & G. S. West Alg. Madag. 1895, p. 58, t. 8, f. 10.
Long. 12μ ; lat. 10μ ; lat. isthm. 4.5μ ; crass. 5μ .
Hab. On the Mountain of Tonglu at 10,000 ft. (27737).
The specimens were rather larger, but otherwise exactly similar.
145. *C. pachydermum* Lund. Desm. Succ. 1871, p. 39, t. 15, f. 15; W. & G. S. West, Brit. Desm. 1905, p. 139.
Var. *aethiopicum* W. & G. S. West, Brit. Desm. 1905, p. 140.
Long. 58μ ; lat. 40μ ; lat. isthm. 26μ ; crass. 33μ .
Hab. In ditch at edge of rice field near Sadiya (32683).
The specimens were small but exactly typical in form, and the semicells had not the truncate base of var. *minus* Nordst.
146. *C. granatum* Bréb. in Ralfs Brit. Desm. W. & G. S. West., Brit. Desm. 1905, p. 186.
Hab. In the River Dihang between Paak and its tributary the Sile River (37689).
147. *C. pseudopyramidatum* Lund. Desm. Succ. 1871, p. 41, t. 2, f. 18; W. & G. S. West, Brit. Desm. 1905, p. 201. (*C. pyramidatum* Ralfs. Brit. Desm. 1848, p. 94, t. 15, f. 4, d, e, f.)
Hab. In ditch at edge of rice field near Sadiya (32683).
148. *C. variolatum* Lund. Desm. Succ. 1871, p. 41, t. 2, f. 19; W. & G. S. West, Brit. Desm. 1905, p. 203.
Var. *cataractarum* Rac. Desm. Now. 1889, p. 79, t. 5, f. 3.
Hab. In non-permanent water, Haflong (33019).
149. *C. Garrolense* R. & R. Scott. Desm. 1894, p. 101, t. 2, f. 4; W. & G. S. West, Brit. Desm. 1908, p. 12.
Long. 26μ ; lat. 20μ ; lat. isthm. 7μ ; crass. 14μ .
Hab. On the Mountain of Tonglu at 10,000 ft. (27737).
This is the first extra-British record for this species.
150. *C. connatum* Bréb. in Ralfs Brit. Desm. 1848, p. 108, t. 17, f. 10; W. & G. S. West, Brit. Desm. 1908, p. 25.

- Long. 70μ ; lat. 50μ ; lat. isthm. 42μ .
 Hab. In shallow still water, Haflong (32700).
151. *C. quadratum* Ralfs Brit. Desm. 1848, p. 92, t. 15, f. 1a ; W. & G. S. West Brit. Desm. 1908, p. 57.
 Forma Willei W. & G. S. West, Brit. Desm. 1908, p. 59.
 Hab. On the Mountain of Tonglu at 10,000 ft. (27737).
152. *C. Sinostegos* Schaarschm. Magyar Desm. 1882, p. 266, t. 1, f. 12 ; W. & G. S. West, Brit. Desm. 1908, p. 79.
 Var. *obtusius* Gutw. W. & G. S. West, Brit. Desm. 1908, p. 79, t. 71, f. 40.
 Hab. With the preceding species (27737).
153. *C. angulosum* Bréb.
 Var. *concinnum* (Rab.) W. & G. S. West, Brit. Desm. 1908, p. 94.
 Hab. Calcutta (28184).
154. *C. Portianum* Arch. W. & G. S. West, Brit. Desm. 1908, p. 165.
 Hab. In stream, Raxaul on the Nepal border (29361).
155. *C. maculatum* W. B. Turner, Alg. E. India 1893, p. 49, t. 7, f. 31, t. 8, f. 68 ; W. & G. S. West, Alg. Ceylon, 1902, p. 163.
 Hab. In pool at 8,500 ft. above Matiana (28064).
156. *C. laticeps* Grun. in Rabenh. Flor. Eur. Alg. 1868, p. 168 ; Nordst. Alg. New Zealand 1888, p. 57, t. 6, f. 10.
 Hab. On the Mountain of Tonglu at 10,000 ft. (27737).
157. *C. subauriculatum* W. & G. S. West, Alg. Mad. 1895, p. 55, t. 6, f. 31 ; Alg. Tangan, 1907, p. 115.
 Hab. In shallow still water Haflong (32700) ; in ditch at edge of rice field near Sadiya (32683).
 This Desmid is now known to occur in Madagascar, Central Africa, Siam, North-Eastern India, and Central China.
158. *C. distichum* Nordst.-Freshw. Alg. N. Zealand. 1888 p. 51, t. 5, f. 16 ; W. & G. S. West, Brit. Desm. 1908, p. 215.
 Forma paullo minor, zygosporis magnis sphaericis, mamillis numerosis praeditis, mamillis aculeis parvis singulis instructis.
 Pl. 11, figs. 5, 6.
 Long. 28μ ; lat. 25μ ; lat. isthm. 6μ ; crass. 17μ ; diam. zyg. sine acul. 34μ ; cum acul. 38μ .
 Hab. In ditch at edge of rice field near Sadiya (32683).
159. *C. binum* Nordst. in Wittr. & Nordst. Alg. exc. 1880, no. 383, fasc. 21, 1889, p. 39 ; W. & G. S. West, Brit. Desm. 1908, p. 246.
 Hab. In ditch at edge of rice field near Sadiya (32683) ; in the River Dihang between Puak and its Tributary the Side River (37689).
160. *C. speciosum* Lund. Desm. Suec. 1871, p. 34, t. 3, f. 5 ; W. & G. S. West, Brit. Desm. 1908, p. 247.

Subsp. *meridionale* Carlson. Süssw. Alg. Antarkt. etc. 1913, p. 41, t. t. f. 12-14.

Long. 38μ ; lat. 28μ ; lat. isthm. 13μ ; crass. 16μ .

Hab. On the Mountain of Tonglu at 10,000 ft. (27737).

The specimens were smaller and had 10 marginal crenations instead of 14, otherwise they were exactly similar to Carlson's figures of specimens from South Georgia.

161. *C. hexalobum* Nordst. Desm. Spetsb. 1872, p. 33, t. 7, f. 16; W. & G. S. West, Brit. Desm. 1908, p. 257.

Var. *minus* R. & B. Scott. Desm. 1894, p. 103, t. 1, f. 12.

Long. 66μ ; lat. 57μ ; lat. isthm. 20μ ; crass. 31μ .

Hab. With the preceding species (27737).

The specimens were nearer var. *minus* in their form, but were very much larger.

162. *C. margaritatum* (Lund.) R. & B. W. & G. S. West, Brit. Desm. 1911, p. 18.

Hab. Near Nataran (27976).

163. *C. crenatum* Ralfs Brit. Desm. 1848, p. 96, t. 15, f. 7, bc; W. & G. S. West, Brit. Desm. 1911, p. 35.

Hab. In shady pool at 8,500 ft. above Matiana (28684).

164. *C. Quadrum* Lund. Desm. Succ. 1871, p. 25, f. 2, t. 11; W. & G. S. West, Brit. Desm. 1911, p. 20.

Hab. In non-permanent stream, Hailong (33019).

165. *C. crenatum* Ralfs Brit. Desm. 1848, p. 96, t. 15, f. 7, b, c; W. & G. S. West, Brit. Desm. 1911, p. 35.

Hab. On the Mountain of Tonglu at 10,000 ft. (27737).

166. *C. tessellatum* (Delp.) Nordst. Alg. et Char. 1880, p. 7. (*Dysphinctum tessellatum* Delp. Desm. subalp. 1877, p. 136, t. 21, f. 10-13).

Hab. In ditch at edge of rice field near Sadiya (32683).

167. *C. cyathiforme* W. & G. S. West, N. Amer. Desm. 1896, p. 248, t. 15, f. 9.

Hab. With the preceding species (32683).

Genus *Xanthidium* Ehrenb.

168. *X. Burkillii* W. & G. S. West, Alg. Burma 1907, p. 210, t. 15, f. 10.

Long. sine sp. 50μ ; cum sp. 80μ ; lat. sine sp. 55μ ; cum sp. 85μ ; lat. isthm. 28μ ; crass. 28μ .

Hab. In ditch at edge of rice field near Sadiya (32683).

169. *X. trilobum* Nordst. Desm. Brasil. t. 111, f. 35.

Var. *indicum* var. nov.

Pl. II, fig. 7.

Var. *minor*, aculeis longioribus, ad angulas geminis non-furcatis; cellulis a vertice visis quadratis angustioribus quam in forma typica, polis valde retusis, angulis productis et aculeis divergentibus.

Long. sine acul. 36μ ; cum. acul. 54μ ; lat. sine acul. 38μ ; cum acul. 48μ ; lat. isthm. 9μ ; crass. 18μ .

Hab. With the preceding species (32683).

This variety differs from the typical form in its simple and longer spines, which are surmounted on the distinctly prolonged angles. In the end view the cell is relatively narrower, and is of rather different form.

It should be compared with *X. calcarato-aculeatum* Hier. (Schmidle in Engl. Botan. Jahrb. xxvi, p. 41, t. 3, f. 5) which has rather different spines and *X. antilopaeum* (Bréb.) Kütz., var. *incertum* Schmidle (ibid. xxxii, p. 71, t. 2, f. 5), from which it differs in its simpler spines with the prolonged hollow bases.

170. *X. hastiferum* Turn. New Rare Desm. 1885, p. 938, t. 15, f. 20. (*X. antilopaeum* Kütz. var. *angulatum* Josh. in Journ. Linn. Soc. Bot. 1886, p. 643, t. 24, f. 16.)

Var. *javanicum* Turn. Freshw. Alg. E. India 1893, p. 100 (*X. antilopaeum* f. *javanica* Nordst. De Alg. et Char. 1880).

Long. sine sp. 39μ ; cum sp. $60-70\mu$; lat. sine sp. 39μ ; cum sp. 58μ ; lat. isthm. 9μ ; crass. 17μ .

Hab. With the preceding species (32683).

171. *X. Raciborskii* Gutw. Alg. Java 1902, p. 589, t. 37, f. 28. Pl. 1, figs. 12-14.

Long. 50μ ; lat. 48μ ; lat. isthm. 22μ ; crass. 29μ .

Hab. Shallow still water, Haflong (32700).

The specimens were somewhat variable, sometimes almost passing into forma *protracta* Gutw. loc. cit. t. 38, f. 29.

172. *X. lepidum* W. & G. S. West, Alg. Ceylon 1902, p. 159, t. 20, f. 22, 23.

Long. 39μ ; lat. 27μ ; lat. isthm. 8μ ; crass. 19μ .

Hab. In ditch at edge of rice field near Sadiya (32683).

V Genus *Arthrodesmus* Ehrenb.

173. *A. convergens* Ehr. Inf. 1858, p. 152, t. 10, f. 18; W. & G. S. West, Brit. Desm. 1911, p. 106.

Cum zygosporia.

Hab. In ditch at edge of rice field near Sadiya (32683).

174. *A. curvatus* Turn. Freshw. Alg. E. India, 1893, p. 135, t. 11, f. 31, 33, t. 12, f. 2, 7, 13, 15.

Long. 43μ ; lat. sine sp. 45μ ; cum sp. 85μ ; lat. isthm. 14μ .

Hab. With the preceding species (32683).

175. *A. fusiformis* W. & G. S. West, Alg. Burma 1907, p. 212, t. 15, f. 4.

Hab. In ditch at edge of rice field near Sadiya (32683).

Genus *Staurostrum* Meyen.

176. *S. apiculatum* Bréb. Liste Desm. 1856, p. 142, t. 1, f. 23.
Long. 26μ ; lat. 34μ ; lat. isthm. 7μ .
Hab. With the preceding species (32683).
177. *S. connatum* R. & B. Jap. Desm. 1886, p. 237. (*S. dejectum* var. *connatum* Lund. 1871, p. 60).
Hab. With the preceding species (32683).
178. *S. leptodermum* Lund. Desm. Suec. 1871, p. 58, t. 3, f. 26.
Var. *Ikapoe* (Schmidle) W. & G. S. West, Alg. Burma 1907, p. 211, t. 15, f. 5, 6. (*S. Ikapoe* Schmidle in Engl. Botan. Jahrb. 1902, p. 74).
Long. sine sp. 40μ ; cum sp. 55μ ; lat. 31μ ; lat. isthm. 23μ .
Hab. With the preceding species (32683).
179. *S. unicum* Turn. Alg. E. India 1893, p. 107, t. 15, f. 16.
Long. 23μ ; lat. sine sp. 23μ ; cum sp. $33-37\mu$; lat. isthm. 6.5μ .
Hab. With the preceding species (32683).
180. *S. cuspidatum* Bréb. in Ralfs Brit. Desm. 1848, p. 122, t. 21, f. 1, t. 33, f. 10.
Forma *incurva* Heimerl, Desm. alp. 1891, p. 604, t. 5, f. 19.
Hab. With the preceding species (32683).
181. *S. bifidum* Bréb. in Ralfs Brit. Desm. 1848, p. 215.
Hab. With the preceding species (32683).
The spines were, as a rule, never in the same plane (cf. W. & G. S. West, Alg. Ceylon, 1902, p. 176).
182. *S. striolatum* (Näg.) Arch. in Pritch. Infus. 1861, p. 740; W. & G. S. West, Brit. Desm. 1911, p. 177.
Hab. Non-permanent stream, Haflong (33019).
183. *S. punctulatum* Bréb. in Ralfs Brit. Desm. 1848, p. 133, t. 22, f. 1.
Var. *Kjellmani* Wille. W. & G. S. West, Brit. Desm. 1911, p. 182.
Long. 23μ ; lat. $16-19\mu$; lat. isthm. 8μ .
Hab. Shallow still water Haflong (32683); (25390).
The specimens were much smaller than usual.
184. *S. dilatatum* Ehr. Inf. 1838, p. 143, t. 10, f. 13; W. & G. S. West, Brit. Desm. 1911, p. 172.
Long. 32.5μ ; lat. 26μ ; lat. isthm. 11μ .
Hab. On the Mountain of Tonglu at 10,000 ft. (27737).
The specimens were usually triangular in the end view, although one specimen was observed in which one semicell was triangular and the other quadrangular.
185. *S. tetracerum* Ralfs Brit. Desm. 1848, p. 137, t. 23, f. 7.
Hab. In ditch at edge of rice field near Sadiya (32683).

186. *S. Cerastes* Lund. Desm. Suec. 1871, p. 69, t. 4, f. 6.
 Var. *ceylanicum* W. & G. S. West. Alg. Ceylon 1902, p. 184, t. 22, f. 4.
 Long. 32 μ ; lat. cum pr. 40 μ ; lat. bas. semicell. 9 μ ; lat. isthm. 7 μ .
 Hab. In ditch at edge of rice field near Sadiya (32683).
187. *S. Hantzschii* Reinsch Spec. Alg. Fung. 1866, p. 129, t. 22D, f. 4, 6.
 Var. *cornutum* Turn. Alg. E. India 1893, p. 120, t. 15, f. 23.
 Long. sine proc. 20 μ ; cum pr. 29 μ ; lat. sine pr. 16 μ ; cum pr. 24 μ ;
 lat. isthm. 5 μ ; long. proc. 5 μ .
 Hab. With the preceding species (32683).
188. *S. tohopocaligense* Wolle 1885; Freshw. Alg. U. S. 1887, p. 45, t. 59,
 f. 4, 5. (*S. nonanum* Turn. Freshw. Alg. E. India 1893, p. 119, t. 15,
 f. 14).
 Var. *trifurcatum* W. & G. S. West. Alg. Madag. 1895, p. 80, t. 9, f. 8.
 Long. sine proc. 32 μ ; cum pr. 47 μ ; lat. sine pr. 32 μ ; cum pr. 42 μ ;
 lat. isthm. 9 μ .
 Hab. With the preceding species (32683).
189. *S. pinnatum* Turn. Alg. E. India 1893, p. 115, t. 13, f. 27.
 Var. *subpinnatum* (Schmidle) W. & G. S. West. Alg. Ceylon 1902, p. 182
 (*S. subpinnatum* Schmidle in Flora lxxxii, 1896, p. 311, t. 9, f. 20).
 Long. 22 μ ; lat. cum pr. 28 μ ; lat. isthm. 9 μ .
 Hab. With the preceding species (32683).
190. *S. subgracillimum* W. & G. S. West. Some N. Amer. Desm. 1896, p. 263,
 t. 17, f. 3, 4.
 Hab. With the preceding species (32683).
191. *S. cyclacanthum* W. & G. S. West. Alg. Ceylon 1902, p. 189, t. 22, f. 18.
 Hab. With the preceding species (32683).
192. *S. galeatum* Turn. Alg. E. India 1893, p. 122, t. 14, f. 3, 9, 10; W. &
 G. S. West. Alg. Ceylon 1902, p. 190, t. 22, f. 19. (*S. subprotractum*
 Schmidle in Engler, Bot. Jahrb. xxvi, 1898, p. 55, t. 4, f. 3.)
 Long. 26 μ ; lat. cum pr. 37 μ ; lat. isthm. 6.5 μ .
 Hab. With the preceding species (32683).
193. *S. coniectum* Turn. Alg. E. India 1893, p. 111, t. 15, f. 20.
 Long. 34 μ ; lat. 35 μ ; lat. isthm. 9 μ .
 Hab. With the preceding species (32683).
194. *S. Wallichii* Turn. Freshw. Alg. E. India 1893, p. 117, t. 13, f. 24.
 Var. *aequale* var. nov. Pl. II, fig. 9, 10.
 Var. *processibus basalibus cum superioribus aequalongis; isthmo*
latiore.
 Long. sine pr. 31 μ ; cum pr. 45 μ ; lat. sine pr. 29 μ ; lat. cum pr.
 40 μ ; lat. isthm. 16 μ .
 Hab. With the preceding species (32683).

The specimens were very similar to Turner's figures, differing chiefly in the somewhat broader isthmus, and in the processes of the lower whorl, which instead of being shorter, were about equal in size to those of the upper whorl. In some specimens, both whorls of processes were very much shortened and sometimes dilated. The end view was invariably 5-angled.

Genus *Oocardium* Näg.

195. *O. stratum* Näg. Gatt. einz. Alg. 1849; Senn in Botan Zeitung 1899, p. 81.

Var. *minor* var. nov.

Pl. 11, figs. 21-24.

Var. *forma typica multo minor*.

Zygosporis polyhedricis vel rectangularibus, membrana laevi, sed mamilis magnis irregularibus instructa.

Long. cell. 7-8 μ ; lat. 12-14 μ ; crass. 7.5-9.5 μ ; diam. zyg. 15-20 μ .

Hab. Small stream under Pongging in the Abor Hills (36169).

The Alga was forming a stony stratum about 1 mm. in thickness over certain leaves, which had apparently fallen into the stream, and had become covered with a thin film consisting of filamentous Bacteria, fungal hyphae and other debris. The leaf and debris were quite encased in the calcareous mass. In the upper part of the stratum the characteristic radiating stony tubes of the *Oocardium* could be recognised, with the tiny cells at their upper aperture.

The cells were little more than half their usual size, and zygosporis were very plentiful, all stages in the fusion of the gametes and the formation of the zygosporis being present. The young zygosporis were at first greenish, but later became deep olive-brown.

It is peculiar that although this extraordinary Desmid has been known for so many years its zygosporis have only just been found. It is particularly gratifying that they have at last been discovered, since it is now proved beyond all doubt that the Alga is placed in its proper systematic position.

Oocardium stratum has previously only been known from certain localities in Central Europe, and its discovery in India is particularly interesting.

Genus *Onychonema* Wallich.

196. *O. laeve* Nordst. Desm. Brasil. 1869, p. 206, t. 3, f. 34.

Var. *microcanthum* Nordst. De Alg. et Char. 1880, p. 3.

Long. 13 μ ; lat. cum sp. 23-25 μ .

Hab. In ditch at edge of rice field near Sadiya (32683).

Genus *Hyalothea* Kutz.

- 197.
- H. Burmensis*
- W. & G. S. West Alg. Burma 1907, p. 225, t. 12, f. 1-4.

Pl. 11, fig. 8.

Cum zygosporis.

Long. cell 11-15 μ ; lat. 19 μ ; long. zyg. 29 μ ; lat. zyg. 22 μ .

Hab. With the preceding species (32683).

The wall of the zygospore was provided with smaller and much more numerous mamillae than those figured by W. & G. S. West. Possibly their zygospores were not quite mature.

- 198.
- H. mucosa*
- (Dillw.) Ehr.

Var. *minor* Delp.

Hab. On floating leaves in marsh Kawkareik (30372).

Genus *Desmidium* Ag.

- 199.
- D. Baileyi*
- (Ralfs) Nordst. De Alg. et Char. 1880. (
- Aptogonum Baileyi*

Ralfs Brit. Desm. 1848, p. 208, t. 35, f. 1.

Hab. In ditch at edge of rice field near Sadiya (32683).

OEDOGONIACEAE.

Genus *Oedogonium* Link.

- 200.
- O. plagiostomum*
- Wittr. Hirn. Monogr. Oedog. 1900, p. 100.

Long. cell. veg. 30 μ ; ca 5-plo longior.; crass. oog. 57-60 μ ; long.60 μ ; diam. oosp. 50 μ .

Hab. With the preceding species (32683).

- 201.
- O. taphrosporum*
- Hirn & Nordst. in Hirn Monogr. Oedog. 1900, p. 133.

Lat. cell. veg. 28 μ ; diam. oog. 78-85 μ ; long. oog. 95-105 μ ; diam.oosp. 70-73 μ .

Hab. With the preceding species (32683).

This species has only been previously found in Brazil. Only a fragment was observed in the present case, and the male plants were not seen, but it agreed so well that there seemed no doubt as to its identity.

- 202.
- O. acmandrium*
- Elfv. in Hirn Monogr. Oedog. 1900, p. 150.

Lat. cell. veg. 8 μ ; crass. oog. 30 μ .

Hab. With the preceding species (32683).

- 203.
- O. mamiferum*
- Wittr. in Hirn Monogr. Oedog. 1900, p. 175, t. 28, f. 165.

Lat. cell veg. 4.5 μ ; ca 4-plo longior.; crass. oog. 22-25 μ ; long. 20 μ ;crass. oosp. 14 μ ; long. 10 μ .

Hab. In shallow still water Haflong (32700).

The plants were rather smaller than usual, and were very plentiful. The projections of the oogonia were almost straight on their upper edge but biundulate at their lower margin.

204. *O. spirale* Hirn Monogr. Oedog. 1900, p. 201, t. 33, f. 206.

Var. *acutum* W. & G. S. West, Alg. Ceylon 1902, p. 128, t. 17, f. 3-5.

Lat. cell. veg. 25-28 μ ; lat. oog. 56 μ ; long. 60 μ ; diam. oosp. 47 μ ;
lat. nannandr. 9 μ ; long. 82-92 μ .

Hab. In ditch at edge of ricefield near Sadiya (32683).

205. *O. Wolleanum* Wittr. in Hirn Monogr. Oedog. 1900, p. 220, t. 37, f. 226.

Lat. cell. veg. 15-20 μ ; crass. cell. suffult. 40 μ ; crass. oog. 50-55 μ ;
long. 65-70 μ .

Hab. With the preceding species (32683).

The plants were a little smaller but in other respects exactly similar.

206. *O. Borisianum* (Le Cl.) Wittr. in Hirn Monogr. Oedog. 1900, p. 217, t. 36, f. 223.

Lat. cell. veg. 16 μ ; crass. cell. suffult. 33 μ ; crass. oog. 37 μ .

Hab. With the preceding species (32683).

207. *O. oblongum* Wittr. in Hirn Monogr. Oedog. 1900, p. 185, t. 29, f. 181.

Hab. On the Mountain of Tonglu at 10,000 ft. (27737).

208. *O. cyathigerum* Wittr. in Hirn Monogr. Oedog. 1900, p. 252.

Var. *perfecta* Hirn. Monogr. Oedog. 1900, p. 254, t. 43, f. 268.

Crass. cell. veg. 30-35 μ ; crass. oog. 79 μ ; long. oog. 110 μ ; diam.
oosp. 76 μ .

Hab. In ditch at edge of rice field near Sadiya (32683).

209. *O. tapeinosporum* Wittr. in Hirn Monogr. Oedog. 1900; p. 297, t. 23, f. 117.

Crass. cell. veg. 2-3 μ ; crass. oog. 15-16 μ ; long. 17-19 μ ; crass. oosp.
14 μ ; long. 8 μ .

Hab. With the preceding species (32683).

210. *O. calvum* Wittr. in Hirn Monogr. Oedog. 1900, p. 316, t. 50, f. 323.

Crass. fil. veg. 7-9 μ ; crass. oog. 27 μ ; long. oog. 25 μ .

Hab. In water under rocks, at Sembadew in the Sipna valley (31345);
in the Sipna stream (31268).

Sterile species of *Oedogonium* occurred in Nos. 26847, 28064 and 28825.

Genus *Bulbochaete* Ag.

211. *B. elatior* Pringsh. in Hirn Monogr. Oedog. 1900, p. 321, t. 51, f. 327.

Crass. cell. veg. 15-17 μ ; crass. oog. 40-43 μ ; long. 35 μ .

Hab. In ditch at edge of rice field near Sadiya (32683).

212. *B. nana* Wittr. in Hirn Monogr. Oedog. 1900, p. 349, t. 57, f. 363.

Crass. oog. 24 μ ; long. 40 μ .

Hab. With the preceding species (32683).

OPHIOCYTIACEAE.

Genus *Ophiocytium* Näg.

213. *O. cochleare* (Eichwald) A. Br. Lemmermann in Hedw. 1899, p. 30, t. 3, f. 10-12.

Hab. At Chittagong (28064) ; with the preceding species (32683).

TRIBONEMACEAE.

Genus *Tribonema* Derbes & Sol.

214. *T. bombycinum* (Ag.) Derbes and Sol. Mém. sur physiol. Alg. 1856, p. 18, t. 4, f. 16-21.

Forma tenuis Hazen in Mem. Torr. Bot. Club 1902, p. 185.

Hab. In various springs near Kakarhatti at 2,500 ft.—2,800 ft. (28842).

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ERRATA TO "FRESHWATER ALGAE FROM INDIA."

REC. BOT. SURV., INDIA, IX, No. 4, pp. 263—302.

Page 267—

No. 4. *Instead of (Walroth) read (Wallroth).*

No. 6. *Instead of S. thermalis, read ? S. thermalis.*

Page 268—

No. 8. *Forma minor. Instead of gracillioribus, read gracilioribus.*

No. 9. *Instead of P. Thomasianum, read ? P. Thomasianum.*

Page 269—

No. 11. 4 lines down. *After Alg. New Guinea, insert Flora 83, 1897.
Delete 1900.*

7 lines from bottom, *instead of BACILLARIAE read BACILLARIEAE.*

Page 270—

No. 15. *Instead of Heiv. read Heib. Next line, instead of Kütz read (Kütz.)*

8 lines from top, *instead of FRAGILLARIACEAE, read FRAGI-
LARIACEAE, Next line, instead of Fragillaria read
Fragilaria.*

Page 272—

No. 30. *Instead of N. brevikostrata read N. brevicostata.*

No. 32. *Instead of N. Brebissonia read N. Brebissonii.*

Page 274—

No. 53. Second line. *Instead of Sembadewin read Sembadewin.*

Page 275—

No. 57. *Instead of S. Sm. read W. Sm.*

Page 277—

No. 68. *After p. 180, insert t. 34. Next line, instead of (Raphidium
spirale) read (Raphidium spirale)*

Page 279—

No. 83. Second line, after 50, insert μ ; after 30, insert μ .

Page 280—

6 lines from top, instead of " neither of the Alga nor " read either of the Alga or.

Page 282—

No. 101. 4 lines down, after 80, insert μ .

Page 283—

3 lines from top, before cell becomes very swollen. insert ?.

No. 105. Instead of Rabenh. Alg. Bur. read Rabenh. Alg. Ery.

No. 106. Instead of C. Brebissonii read C. Brebissonii.

Page 284—

No. 114. Instead of C. calosporum read C. calosporum.

Page 285—

7 lines from top, instead of p. 225 read p. 235.

No. 118. Instead of Chlor. 1899, f. 15, read Chlor. 1899, p. 15.

Page 286—

No. 124. Instead of E. pulchellum read E. pulcherrimum.

Page 288—

4 lines from top, instead of latisthm, read lat. isthm.

No. 136. Instead of M. Crux-melitensis, read M. Crux-Melitensis.

3 lines further on, instead of Hab. On ditch read Hab. In ditch.

Page 289—

No. 143. Second line, after Racib add a full stop

No. 145. Instead of p. 39, t. 15, f. 15, read p. 39, t. 2, f. 15.

3 lines further on, instead of lat. 40 μ , read lat. 49 μ .

No. 146. After Ralis Brit. delete comma

No. 149. Instead of C. Garroloense R. & R., read C. Garroloense R. & B.

Page 232—

No. 173. *Instead of Ehr. Inf. 1858 read Ehr. Inf. 1838.*

Page 294—

No. 189. *Insert a full stop after Turn.*

No. 194, Var. **aequale**. *Instead of Var. processibus, read Var. processibus.*

Page 295—

No. 196. *Instead of Var. microcanthum read Var. micracanthum.*

Page 296—

No. 200. *Delete a full stop after, Hirn.*

Page 297—

No. 208. *Delete a full stop after Var. perfecta Hirn.*

Page 299—

Second line from top, *instead of Alagarum unicellularum read Alagarum unicellularum.*

9 lines from top, *instead of Sussw. read Süßw., and instead of Uber, read Über.*

Omit the 24th and 25th lines from top.

Line 30, *instead of Untersuchungen über die. read Untersuchungen über die*

Line 32. *Instead of Delphonte read Delaponte.*

Insert, two lines from bottom :—

Gay, Note Conjugées. F. Gay. Note sur les Conjugées du midi de l'France. Bull. Soc. bot. France 31. 1884.

Second line from bottom, *instead of Goment read Gomont.*

Page 300—

Line 20, *instead of Varietaten read Varietäten.*

Line 23, *instead of Bemerkungen über read Bemerkungen über.*

5 lines from bottom, *instead of Symbolae read Symbolae ad.*

Page 301.—

4 lines from top, *instead of Kongli read Kongl.*

Line 25, *after Kozlemenyek, add XVIII, 1882.*

Last line, *instead of African, read Africa.*

Page 302.—

Line 16, *instead of Olands Sotvattens-Alger, read Olands sötvtattens Alger.*

In description of the plates.

FIG. 7, *instead of var. bov. read var. nov.*

FIGS. 9, 10, *instead of bar. nov. read var. nov.*

FIGS. 21-24, *instead of van. nov. read var. nov.*